

GERALD M. LAPORTE

Curriculum Vitae

Positions: United States Government
Washington, DC USA

Forensic Chemist & Document Specialist
Riley Welch LaPorte & Associates Forensic Laboratories
Lansing, Michigan USA

Education: University of Alabama at Birmingham (1994)
Birmingham, Alabama USA
Master of Science in Forensic Science (M.S.F.S.)

University of Windsor (1992)
Windsor, Ontario Canada
Bachelor of Commerce in Business Administration

University of Windsor (1990)
Windsor, Ontario Canada
Bachelor of Science in Biology (B.Sc.)

Professional

Experience: **United States Government (03/09 – Present)**

Forensic Policy Program Manager

Duties: Provide expert analysis and advice on agency-wide programs or issues of national impact relating to forensic science; provide expert advice to top management officials; identify reasons for the nature and/or extent of program-related problems that arise and investigate area in need of improvement; write comprehensive resolution recommendations; formally present findings before large and diverse audiences, such as Federal, state, and local government representatives, special interest groups, the scientific community, and the media.

United States Secret Service (11/07 – 03/09)

Chief Research Forensic Chemist

Duties: Serve as the technical liaison and research chemist for the United States Secret Service pertaining to issues related to the chemistry of documents and fingerprints; coordinating clandestine tagging programs; direct all research projects within the Forensic Services Division.

Laboratory Duties: perform physical and chemical examinations on a variety of documents to determine how they were produced, where they may have originated from, and if they are authentic. These types of documents include anonymous letters (e.g., threatening, kidnapping, and extortion), suspected counterfeit identifications and financial documents (e.g. travelers checks, credit cards), contracts, and other miscellaneous written materials. Chemical examinations are conducted using thin layer chromatography (TLC), gas chromatography/mass spectrometry (GC/MS), liquid chromatography-mass spectrometry (LC/MS), infrared spectroscopy (IR), scanning electron microscopy/energy dispersive x-ray analysis (SEM/EDXA); perform chemical tests on unknown (e.g. miscellaneous powders) and controlled substances; testify in court as an expert witness.

Administrative Duties: responsible for the overall activities of the instrumental analysis laboratory including supervising interns and contractors, establishing fiscal year budgets for laboratory supplies, maintaining and purchasing all laboratory equipment, and the overseeing of two of the world's largest databases for writing and printer inks; participate in the hiring of new employees and the training of new forensic document examiners within the instrumental laboratory.

Marymount University (08/08 – 01/09)

Adjunct Professor of Forensic Science

Arlington, VA

Duties: Prepare and conduct lecture material in various areas of the forensic sciences and prepare all laboratory exercises and examinations for graduate students

United States Secret Service, Washington, DC (04/01 – 03/09)

Virginia Division of Forensic Science, Richmond, VA (11/99 – 04/01)

Forensic Scientist

Duties: analyze evidence for the presence or absence of controlled substances using a variety of chemical and instrumental tests; utilize sophisticated instrumentation such as gas chromatography/mass spectrometry and Fourier transform infrared spectroscopy; testify in court as an expert witness

Anne Arundel County Police Department Crime Lab, Millersville, MD (01/99 -11/99)

Forensic Chemist

Duties: similar to the aforementioned duties for Virginia Division of Forensic Science

Accu-Chem Laboratories, Richardson, TX (07/96 – 09/98)

Forensic and Clinical Toxicology Specialist

Duties: supervisor of toxicology department; sales and marketing of drug testing and occupational and environmental toxicology testing; serve as a liaison to physicians and personnel responsible for forensic urine drug testing; testify in court as an expert witness in the area of forensic urine drug testing

Jefferson County Coroner/Medical Examiner Office, Birmingham, AL (09/93 - 07/96)

Autopsy Assistant/Forensic Technician

Duties: identify, collect, preserve, and document any potential evidentiary material; eviscerate all human organs and document any relevant findings; perform histological examinations

University of Alabama at Birmingham, Birmingham, AL (01/94 – 07/96)

Guest Forensic Science Lecturer

Duties: lecture on areas related to forensic pathology and death investigation to undergraduate and graduate students

Honors/Professional Affiliations:

American Academy of Forensic Sciences (AAFS)

Mid-Atlantic Association of Forensic Scientists (MAAFS)

American Standards for Testing and Materials (ASTM)

American Society of Questioned Document Examiners (ASQDE)

Guest Reviewer for the Journal of Forensic Sciences

Guest Reviewer for the Journal for the American Society of Questioned Document Examiners

Contributing member and Technical Contact in the Scientific Working Group for Questioned Document Examiners (SWGDOC)

Contributing member in the European Document Examiners Working Group (EDEWG) and the International Collaboration for Ink Dating (INCID)

Recipient of the "2005 Forensic Scientist of the Year" by the Mid-Atlantic Association of Forensic Scientists

Recipient of the United States Attorney's Office Eastern District of Virginia "Law Enforcement Public Service Award"

Professional and Scientific Committees:

1. Participating member in the Expert Working Group for Human Factors in Latent Print Analysis
2. Participating member in the Expert Working Group for AFIS Interoperability

3. Co-Chair on the Standards, Practices, and Protocols Inter-Agency Working Group – **Executive Office of the President of the United States**/Office of Science and Technology Policy/National Science and Technology Council/Committee on Science/Subcommittee on Forensic Sciences

Court

Testimony: I have testified approximately 35-40 times in the Commonwealth of Virginia and the States of Texas and Maryland on issues related to forensic urine drug testing and controlled substance analysis.

I have also testified over 25 times on issues related to forensic document examinations in State, Federal, and International courts.

LECTURES AND INSTRUCTIONAL COURSES CONDUCTED

1. **Workshop Instructor.** "Inkjet Technology and Forensic Examinations" at the Annual Meeting for the American Society of Questioned Document Examiners (ASQDE). Dearborn, MI, August 2009.
2. **Workshop Instructor.** "Inkjet Technology and Forensic Examinations" at the Annual Meeting for the Southern Association of Forensic Document Examiners (SAFDE). Peach Tree City, GA, April 8, 2009.
3. **Workshop Instructor.** "Inkjet Technology and Forensic Examinations" at the Skill-Task Training Assessment & Research (ST2AR) Fall Workshop. Las Vegas, NV, October 22-23, 2008.
4. **Workshop Instructor.** "Applications of Light and Color Theory in Forensic Document Examinations" at the American Academy of Forensic Sciences Annual Meeting, Washington, DC, February 18, 2008.
5. **Workshop Instructor.** "Methods Used for Authenticating Questioned Documents" at the Mid-Western Association of Forensic Scientists (MAFS) Annual Meeting, Traverse City, MI, September 25, 2007.
6. **Workshop Instructor.** "Methods Used for Authenticating Questioned Documents" at the American Society of Questioned Document Examiners (ASQDE) Annual Meeting, Boulder, CO August 13-14, 2007.
7. **Instructor for the Midwest Forensic Resource Center (MFRC) – Recorded Training.** Questioned Documents and the Crime Scene, Ames, IA, July 18, 2007.
8. **Instructor at the Federal Bureau of Investigation (FBI) Academy - Forensic Document Examiner Training Seminar, Quantico, VA.** "An Analytical Approach to Forensic Document Examination." April 17, 2007.
9. **Instructor at the George Washington University, Washington, DC.** "An Analytical Approach to Forensic Document Examination." February 28, 2007.
10. **Instructor at Marymount University, Arlington, VA.** An Analytical Approach to Forensic Document Examination." November 14, 2006.
11. **Workshop Instructor.** "Authenticating Documents" American Board of Forensic Document Examiners (ABFDE). Las Vegas, NV, November 6-7, 2006.
12. **Instructor at the George Washington University, Washington, DC.** "An Analytical Approach to Forensic Document Examination." October 18, 2006.
13. **Workshop Instructor.** "The Forensic Examination of Documents Produced with Office Machine Systems Utilizing Inkjet Technology." The International Association for Identification (IAI) 91st International Education Conference, Boston, MA, July 3, 2006.
14. **Workshop Instructor.** "Security Features in Documents." Mid-Atlantic Association of Forensic Scientists Annual Meeting, May 3, 2006.
15. **Instructor at the Federal Bureau of Investigation (FBI) Academy - Forensic Document Examiner Training Seminar, Quantico, VA.** "The Forensic Examination of Inks." April 5, 2006.
16. **International Instructor in Doha, Qatar.** "The Examination of Counterfeit Documents." March 27-28, 2006.
17. **Instructor at Marshall University, Huntington, WV.** "Forensic Science at the United States Secret Service." March 15, 2006.
18. **Instructor at Indiana University-Purdue University at Indianapolis.** "Forensic Science at the United States Secret Service." December 12, 2005.
19. **Workshop Instructor.** "The Forensic Examination of Printing Processes." American Board of Forensic Document Examiners (ABFDE). Las Vegas, NV, November 7-8, 2005.

20. **Instructor at the George Washington University**, Washington, DC. "The Forensic Examination of Printers and Copiers." December 1, 2004.
21. **Instructor at the University of Windsor**, Windsor, Ontario Canada. "Questioned Document Examinations." November 10, 2004.
22. **Instructor at the University of Windsor**, Windsor, Ontario Canada. "Forensic Science at the United States Secret Service." November 9, 2004.
23. **Instructor at the University of Windsor**, Windsor, Ontario Canada. "Forensic Drug Chemistry and Toxicology." November 8, 2004.
24. **Instructor at George Washington University**. "The Forensic Examinations of Inks and Paper." George Washington University, October 27, 2004.
25. **Workshop Instructor**. "The Forensic Examination of Documents Produced By Office Machine Systems Utilizing Inkjet Technology." Northeastern Association of Forensic Sciences, September 30, 2004.
26. **Instructor at Federal Law Enforcement Training Center**. "The Forensic Examination of Printers and Copiers" and "The Forensic Analysis of Inks and Paper." Brunswick, GA. June 21, 2004.
27. **Guest Speaker at the Federal Bureau of Investigation Laboratory**. "Forensic Chemistry and Questioned Document Examinations." Quantico, VA. May 5, 2004.
28. **Instructor at Forest Park High School**. "Applications of Forensic Chemistry." Woodbridge, VA. May 18, 2004.
29. **Workshop Instructor**. "The Forensic Examination of Documents Produced By Office Machine Systems Utilizing Inkjet Technology." Mid-Atlantic Association of Forensic Sciences, April 20, 2004.
30. **Instructor at George Washington University**. "The Forensic Examination of Printers and Copiers." George Washington University, November 20, 2003.
31. **Instructor at George Washington University**. "Ink and Paper Chemistry." George Washington University, October 30, 2003.
32. **Instructor at Marshall University**. "Ink and Paper Chemistry" and "Counterfeit Identification Examinations." Huntington, WV. September 23, 2003.
33. **International Instructor. International Law Enforcement Academy (ILEA)**. "Ink and Paper Chemistry" and Counterfeit Document Examinations." Pretoria, South Africa. May 19-20, 2003.
34. **Instructor at Federal Law Enforcement Training Center**. "Printing Processes" and "Physical and Chemical Analysis of Inks and Paper." Brunswick, GA. June 22, 2003.
35. **International Instructor. International Law Enforcement Academy (ILEA)**. "Ink and Paper Chemistry" and Counterfeit Document Examinations." Pretoria, South Africa. May 19-20, 2003.
36. **International Instructor. International Criminal Investigative Training Program (ICITAP)**, U.S. Department of Justice, "Counterfeit Document Examinations" and "Ink and Paper Chemistry." Sophia, Bulgaria. January 16-17, 2003.

PROFESSIONAL PRESENTATIONS

1. **LaPorte, G.** Forensic Science: The Importance of Research for Practical Casework. Presented as a Keynote Speech at the 1st Annual World Congress of Forensic Science. Dalian, China, October 21, 2010.
2. **LaPorte, G.** The Importance of Validating and Verifying a Standardized Method: Envelope Examinations and the Anthrax Investigation. Presented at the Mid-Atlantic Association of Forensic Scientists Annual Meeting. Hunt Valley, MD, May 8, 2009.
3. **LaPorte, G.** Questioned Documents and Homicide Investigations. Presented at the Annual Meeting for the Virginia Homicide Investigators Association. Norfolk, VA, October 6, 2008.
4. **LaPorte, G.** Questioned Documents and the Sub-Disciplines. Presented at the Symposium on Special Topics in Questioned Document Analysis. Ankeny, IA, September 30, 2008.
5. **LaPorte, G.** An Overview of the Forensic Examinations on Documents Produced Using Inkjet and Thermal Printing Devices and the Increasing Need for Security. 31st Annual Global Inkjet Printing Conference, Budapest, Hungary, March 12, 2008.
6. **LaPorte, G.**, Beuchel, A, and Stephens, J. The Examination of Commercial Printing Defects to Assess Common Origin and Batch Variation. Presented at the American Academy of Forensic Sciences Annual Meeting, Washington, DC, February 22, 2008.
7. **LaPorte, G.** Exonerations and Incarcerations: The Key Role of the Forensic Sciences – Questioned Documents. Presented at the American Academy of Forensic Sciences Annual Meeting, Washington, DC, February 19, 2008.

8. **LaPorte, G.**, Holifield, A, and Stephens, J. The Black Money Scam. Presented at the Mid-Atlantic Association of Forensic Scientists Annual Meeting, Washington, DC, May 24, 2007.
9. Schwartz, R. and **LaPorte, G.** The Effects of Common Environmental Variables on the Infrared Luminescence Properties of Writing Inks. Presented at the Mid-Atlantic Association of Forensic Scientists Annual Meeting, Washington, DC, May 25, 2007.
10. Holifield, A and **LaPorte, G.** Artificially Aged Documents. Presented at the Mid-Atlantic Association of Forensic Scientists Annual Meeting, Washington, DC, May 25, 2007.
11. Voiles, R., Stephens, J., and **LaPorte, G.** The Forensic Examination of Documents Using Print Quality Analysis Software. Presented at the Mid-Atlantic Association of Forensic Scientists Annual Meeting, Washington, DC, May 25, 2007.
12. **LaPorte, G.** Forensic Applications of Chromatography at the United States Secret Service. Presented for the Minnesota Chromatography Forum. Minneapolis, MN, March 27, 2007.
13. **LaPorte, G.** The Necessity of Security Printing for the Forensic Scientist. Presented at the 30th Annual Global Inkjet and Thermal Conference. Prague, Czech Republic, March 2, 2007.
14. **LaPorte, G.**, Stoker, D., Thomas, Y, Stephens, J, and Shaffer, D. The Analysis of 2-Phenoxyethanol for the Dating of Documents. Presented at the 59th Annual Meeting of the American Academy of Forensic Sciences, San Antonio, TX, February 22, 2007.
15. Shaffer, D., Stephens, J. **LaPorte, G.** A Comparison of the Physical and Chemical Characterization of Conventional Toners vs. Chemically Prepared Toners. Presented at the 59th Annual Meeting of the American Academy of Forensic Sciences, San Antonio, TX, February 23, 2007.
16. Nelis, E., **LaPorte, G.**, and Thomas, Y. The Use of Electrospray Ionization – Mass Spectrometry for the Identification of Controlled Substances. Presented at the 59th Annual Meeting of the American Academy of Forensic Sciences, San Antonio, TX, February 23, 2007.
17. **LaPorte, G.** The Forensic Examination of Documents Produced on Office Machine Systems Utilizing Inkjet Technology. Presented at the California Association of Criminalistics Fall Workshop Meeting, October 12, 2006.
18. **LaPorte, G.** The Physical and Chemical Examinations of Documents Produced Using Inkjet Technology. Presented at the 4th Meeting of the European Document Experts Working Group, The Hague, Netherlands, September 28, 2006.
19. Schuler, R., Treado, P.J., Gardner, C., **LaPorte, G.**, Stephens, J. Chemical Imaging for Questioned Document Examination. Presented at the 4th Meeting of the European Document Experts Working Group, The Hague, Netherlands, September 29, 2006.
20. **LaPorte, G.** The Forensic Examination of Documents Produced Using Inkjet Technology. Presented at the Imaging Materials Seminar: Inkjet Ink, Rochester, NY, May 2, 2006.
21. Layman, M. and **LaPorte, G.** Questioned Documents and the Crime Scene. Presented at the 58th Annual Meeting of the American Academy of Forensic Sciences, Seattle, WA, February 23, 2006.
22. Shaffer, D, Stephens, J., and **LaPorte, G.** The Characterization of Envelopes for Questioned Document Examinations. Presented at the 58th Annual Meeting of the American Academy of Forensic Sciences, Seattle, WA, February 23, 2006.
23. Stephens, J. and **LaPorte, G.** The Use of Hyperspectral Contrast Imaging for the Examination of Writing Inks. Presented at the 58th Annual Meeting of the American Academy of Forensic Sciences, Seattle, WA, February 23, 2006.
24. **LaPorte, G.** and Layman, M. The Use of Supplementary Testing in Forensic Document Examinations. Presented at the Annual Meeting for the American Society of Questioned Document Examiners, Montreal, Quebec, August 15, 2005.
25. **LaPorte, G.**, Arredondo, M, McConnell, Cantu, A. The Static Method of Dating Writing Inks – A Preliminary Assessment of the United States International Ink Library. Presented at the Mid-Atlantic Association of Forensic Scientists Annual Meeting, Pittsburgh, PA, May 19, 2005.
26. **LaPorte, G.** The Forensic Examination of Documents Produced Using Inkjet and Thermal Technology. Presented at the 28th Global Inkjet and Thermal Printing Conference, Barcelona, Spain, March 16, 2005.
27. **LaPorte, G.** The Examination of Inkjet Printed Documents – What's on the Frontier? Presented at the 57th Annual Meeting of the American Academy of Forensic Sciences, New Orleans, LA, February 24, 2005.
28. Shaffer, D. and **LaPorte, G.** Applications of Scanning Electron Microscopy/Energy Dispersive X-Ray Analysis at the United States Secret Service. Scanning: The Journal of Scanning Microscopies, Volume 26(2), March/April, 2004.
29. Arredondo, M and **LaPorte, G.** The Forensic Examination of Paper. Presented at the Mid-Atlantic Association of Forensic Scientists Annual Meeting, Wilmington, DE, April 23, 2004.

30. **LaPorte, G.** The Forensic Examination of Documents and Counterfeit Identifications Related to Terrorism and Financial Crimes. International Conference on Asian Organized Crime and Terrorism. Honolulu, HI, April 10-16, 2004.
31. Cochran, J., Glisson, F., and **LaPorte, G.** Characterization of Inks by Solid Phase Microextraction – Gas Chromatography/Time-of-Flight Mass Spectrometry. Pittconn 2004, Chicago, IL.
32. **LaPorte, G.** Analyzing Bar Soaps by Utilizing a Variety of Optical and Chemical Techniques. Presented at the 56th Annual Meeting of the American Academy of Forensic Sciences, Dallas, TX, February 20, 2004.
33. **LaPorte, G.** The Analysis of Volatile Organic Compounds in Ballpoint Inks Using Gas Chromatography/Mass Spectrometry. Presented at the 56th Annual Meeting of the American Academy of Forensic Sciences, Dallas, TX, February 19, 2004.
34. **LaPorte, G.** Inkjet Technology: The Need for Security and Forensic Traceability. Presented at the 11th Annual European Inkjet Printing Conference, Lisbon, Portugal, November 10, 2003.
35. **LaPorte, G.** Cold Cases in Forensic Science. Presented to the Virginia Homicide Investigators Association (VHIA). October 6, 2003.
36. **LaPorte, G.** The Use of an Electrostatic Detection Device (EDD) to Identify Class Characteristics on Documents Produced by Printers and Copiers. Presented at the American Society of Questioned Document Examiners Annual Meeting. August, 2003.
37. Wilson, J & **LaPorte, G.** The Differentiation of Gel Inks using Various Optical and Chemical Techniques. Presented at the Mid-Atlantic Association of Forensic Scientists Annual Meeting, Annapolis, MD, May 8, 2003.
38. **LaPorte, G.** The Analysis of 2-Phenoxyethanol in Ballpoint Inks Using Gas Chromatography/Mass Spectrometry. Presented at the Mid-Atlantic Association of Forensic Scientists Annual Meeting, Annapolis, MD, May 8, 2003.
39. **LaPorte, G.** The Forensic Examination of Thermal Transfer Printing. Presented for Information Management Institute: The 14th Annual Thermal Printing Conference, Scottsdale, AZ, April 28-30, 2003.
40. **LaPorte, G.** The Use of an Electrostatic Detection Device (EDD) to Identify Class Characteristics on Documents Produced by Printers and Copiers. Presented at the American Academy of Forensic Sciences Annual Meeting, Chicago, IL, February, 2003.
41. **LaPorte, G.** The Forensic Examination of Office Machine Systems Utilizing Inkjet and Toner Technology. Presented for Information Management Institute: The 10th Annual European Ink Jet Printing Conference, Lisbon, Portugal, October 28-30, 2002.
42. Payne, J & **LaPorte, G.** The Forensic Examination of Thermal Transfer Printers. Presented at the Mid-Atlantic Association of Forensic Scientists, Frederick Maryland, April 25, 2002.
43. **LaPorte, G** & Ramotowski, R. The Effects of Latent Print Processing on Questioned Documents Produced by Office Machine Systems Utilizing Inkjet Technology and Toner. Presented at the Mid-Atlantic Association of Forensic Scientists, Frederick Maryland, April 25, 2002.
44. **LaPorte, GM** & Davis, G.G. (1995). A Retrospective Study of the Incidence of Drugs in Decomposed Remains in Jefferson County, Alabama. Presented as an oral presentation at the American Academy of Forensic Sciences Annual Meeting, Seattle, WA.
45. Gruszecki, A, Davis, GG, **LaPorte, GM** & Robinson, CA (1995). The Incidence of Corresponding Presence of Cocaine and Cocaethylene in Both Hair and Routine Postmortem Biological Samples. Presented as a poster at the American Academy of Forensic Sciences Annual Meeting, Seattle, WA.

PROFESSIONAL PUBLICATIONS

1. Houlgrave, S., **LaPorte, G.**, and Stephens, J. The Use of Filtered Light for the Evaluation of Writing Inks Analyzed Using Thin Layer Chromatography. Journal of Forensic Sciences. Accepted for Publication in May, 2010. Scheduled date of publication is approximately March, 2011.
2. **LaPorte, G.**, Stephens, J, and Beuchel, A. The Examination of Commercial Printing Defects to Assess Common Origin, Batch Variation, and Error Rate. Journal of Forensic Sciences. January, 2009.
3. Bicknell, D and **LaPorte, G.** "Documents, Forgeries and Counterfeits" in The Wiley Encyclopedia of Forensic Sciences. Pending Publication Date.
4. Arredondo, M., **LaPorte, G.**, Wilson, J., McConnell, T., Shaffer, D., and Stam, M. Analytical Methods Used for the Discrimination of Substances Suspected to be Bar Soap: A Preliminary Study. Journal of Forensic Sciences, Volume 51 (6), November, 2006.

5. **LaPorte, G.**, Arredondo, M., McConnell, T., Stephens, J., Cantu, A., Shaffer, D. An Evaluation of Matching Unknown Writing Inks with the United States International Ink Library. *Journal of Forensic Sciences*, Volume 51 (3), May, 2006.
6. **LaPorte, G.** Modern Approaches to the Forensic Analysis of Inkjet Printing – Physical and Chemical Examinations. *Journal of the American Society of Questioned Document Examiners*, Volume 7, Number 1, June 2004.
7. **LaPorte, G.** The Use of an Electrostatic Detection Device to Identify Individual and Class Characteristics on Documents Produced by Printers and Copiers – A Preliminary Study. *Journal of Forensic Sciences*, Volume 49 (3), May, 2004.
8. **LaPorte, G.**, Wilson, J, Cantu, A. The Identification of 2-Phenoxyethanol in Ballpoint Inks Using Gas Chromatography/Mass Spectrometry. *Journal of Forensic Sciences*, Volume 49 (1), January 2004.
9. Wilson, J, **LaPorte, G.**, Cantu, A. Differentiation of Black Gel Inks Using Optical and Chemical Techniques. *Journal of Forensic Sciences*, Volume 49 (2), March 2004.
10. **LaPorte, G.** Published Book Review, “Advances in the Forensic Analysis and Dating of Writing Ink.” *Journal of Forensic Identification* Volume 53(6), 2003\735.
11. **LaPorte, G.**, Wilson, J, Mancke, S. Amanda, Payne, J, Ramotowski, R, & Fortunato, S. The Forensic Analysis of Thermal Transfer Printers, *Journal of Forensic Sciences*, Volume 48 (5), September 2003.
12. **LaPorte, G** & Ramotowski, R. The Effects of Latent Print Processing on Questioned Documents Produced by Office Machine Systems Utilizing Inkjet Technology and Toner, *Journal of Forensic Sciences*, Volume 48 (3), May, 2003.
13. Lovett Doust, J & **LaPorte, G** (1991). Population Sex Ratios, Population Mixtures and Fecundity in a Clonal Dioecious Macrophyte, *Vallisneria Americana*. *Journal of Ecology*. 79: 477-489.